

Microsoft® Research

Faculty Summit 2010

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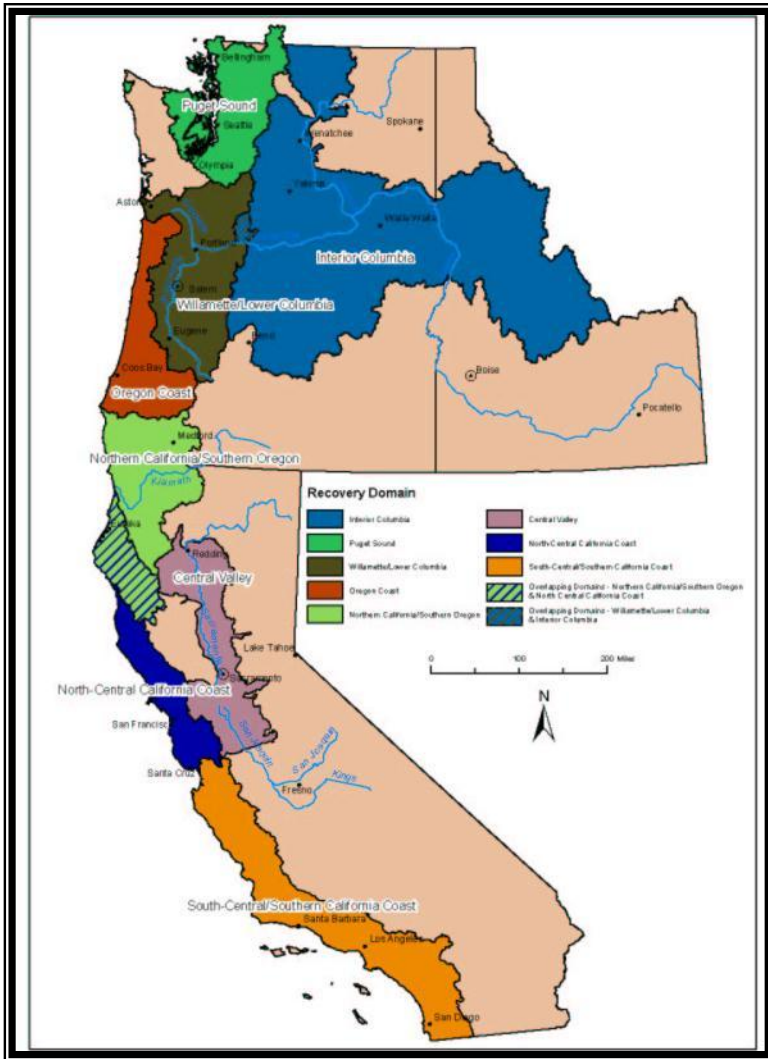
Faculty Summit 2010

Environmental Data Management

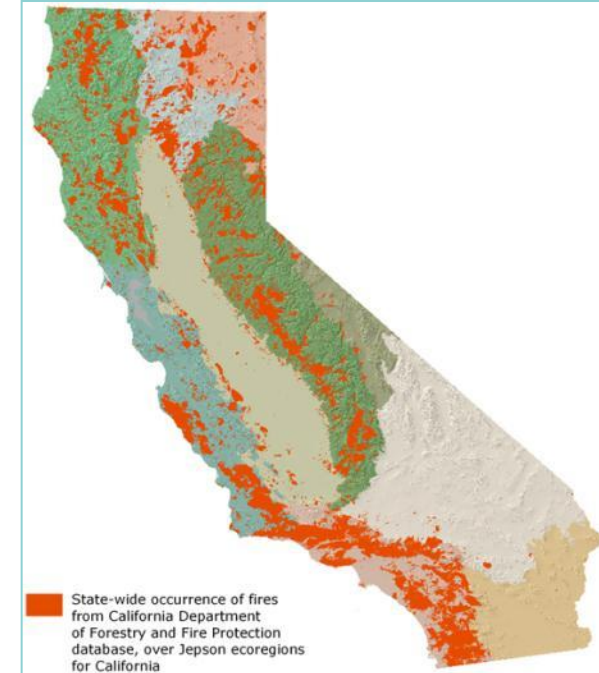
Deb Agarwal

Berkeley Water Center - University of California and
Lawrence Berkeley National Laboratory

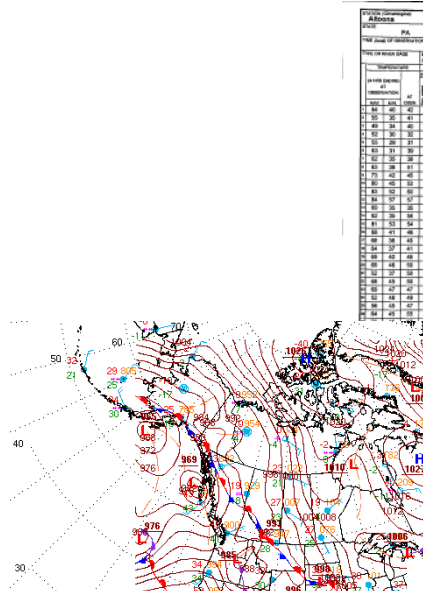
Global and Regional Eco-Science



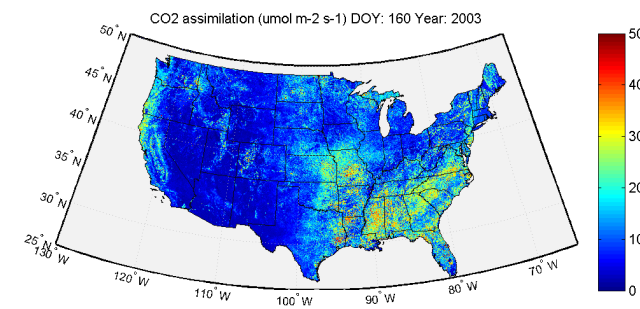
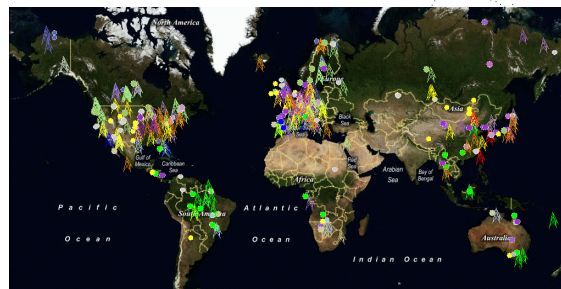
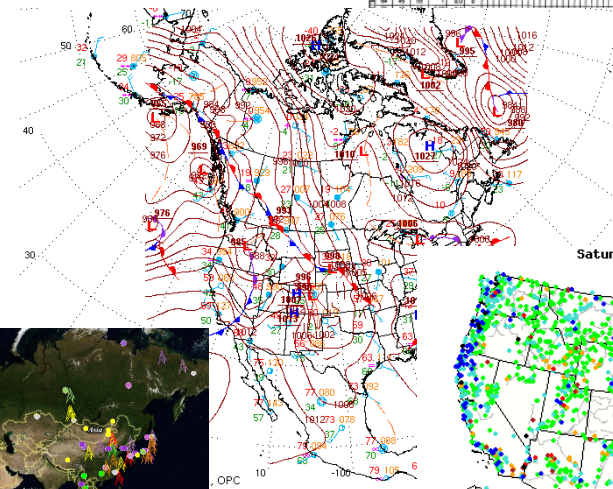
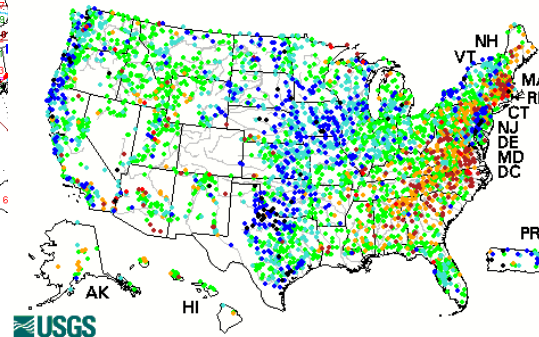
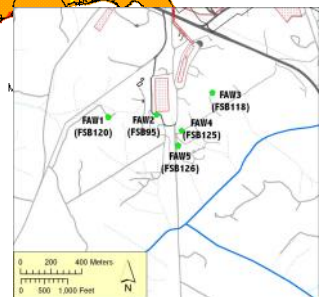
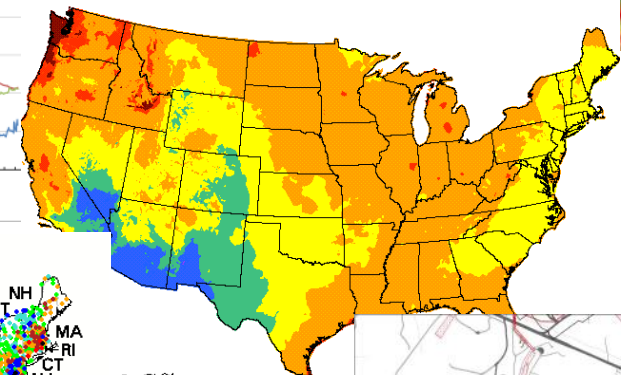
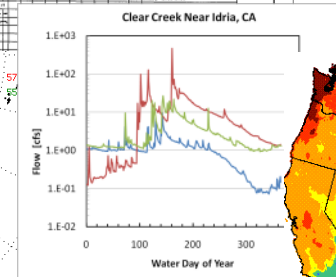
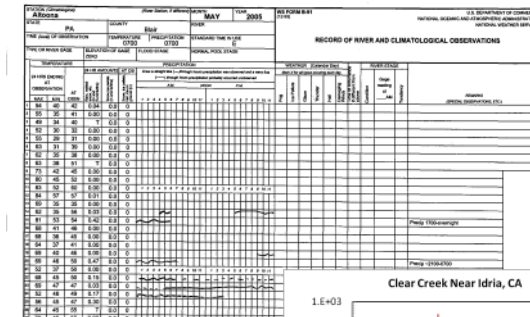
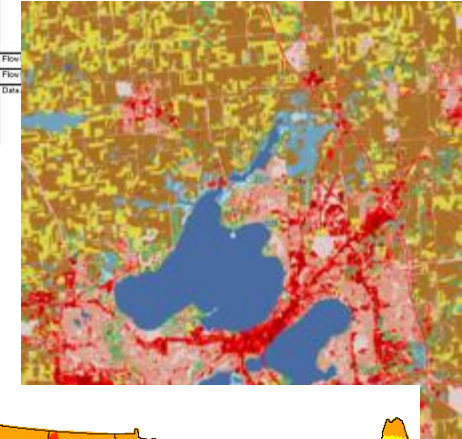
- A major shift is happening in the way eco-science is done.
 - Moving from individual studies of local processes to collaborative studies of regional and global processes. (e.g. studying the impact of climate change)
- Studying global scale environmental processes requires:
 - Integration of local, regional, and global spatial scales.
 - Integration across disciplines, e.g., climatology, hydrology, forestry, etc., and across methodologies (field observations, remote sensing, and modeling).



Data Rich Environment

- National and International Datasets
 - USGS National Water Information System
 - NOAA National Climatic Data Center
 - FLUXNET Network
 - Satellite data (e.g. MODIS)
 - Local Datasets
 - Local Agencies
 - Companies (e.g. Timber)
 - Ecology Organizations
 - Individual Researchers
- 

	A	B	C	D	E	F	G	H	I
	Page	Target	Habitat Attribute	Indicator	Method	Status		Poor	Fair
1	3	8. Spawning Adults	Embry	Passage in Mouth	Pool Option			<30 days	30-60 days
2		9. Spawning Adults	Hydrology	Passage Flood	Flow Panel Results	DOME			
3		8. Spawning Adults	Passage	Physical Barriers	Passage Database	FSUAL		<60% of IP km	50-70%
4	5	10. Spawning Adults	Viability	Freshwater Harvest	Review Regulations	Straw?			
5		10. Spawning Adults	Viability	Density Toler	NWFS Calculation	Apply TDT Criteria		Watershed Specific	
6		Spawning Adults	Sediment	Spawning Gravel	Take all tailouts with emb. rating 10, multiply by avg width of little squared	Hostland Deking Quarries			
7	10	10. Eggs	Hydrology	Instantaneous Condition	Flow				
8									



Data Comes in Many Forms



Manual Measurement



Automated Measurement



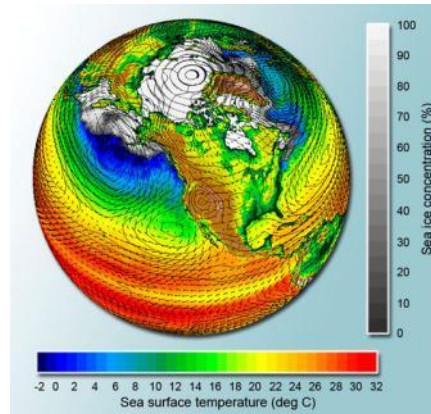
Sample Collection



Typing



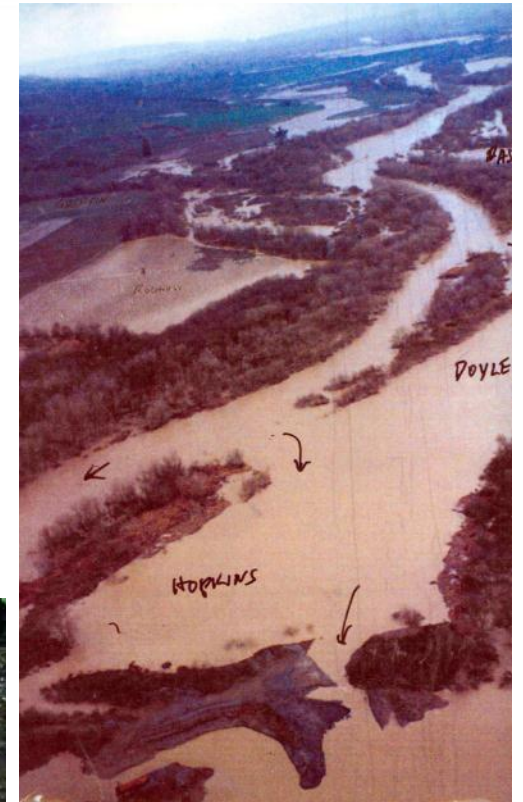
Aircraft Surveys



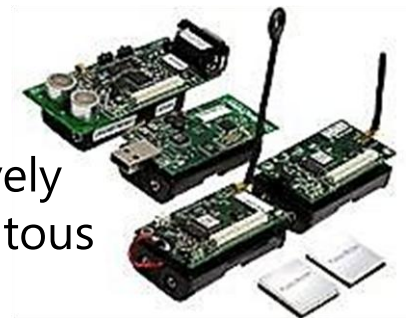
Model Output



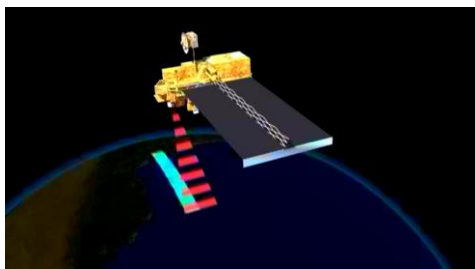
Counting



Historical Photographs




Relatively Ubiquitous Motes



Satellite

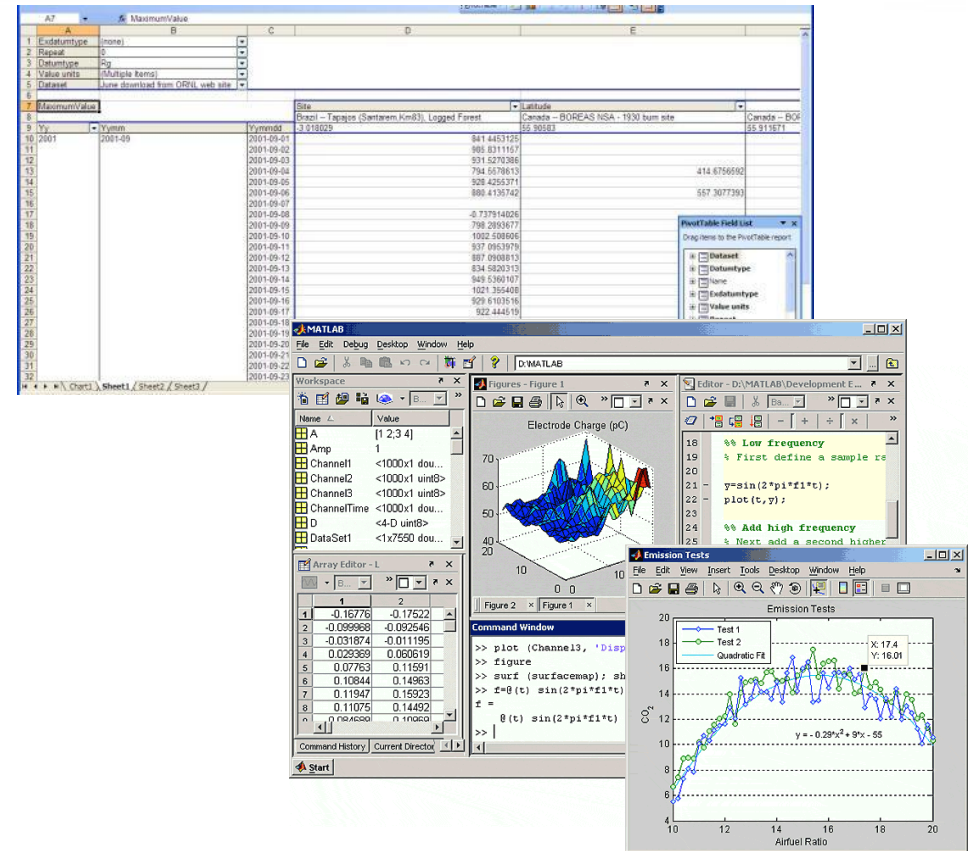
Data Synthesis – The Challenge of Bringing it all Together



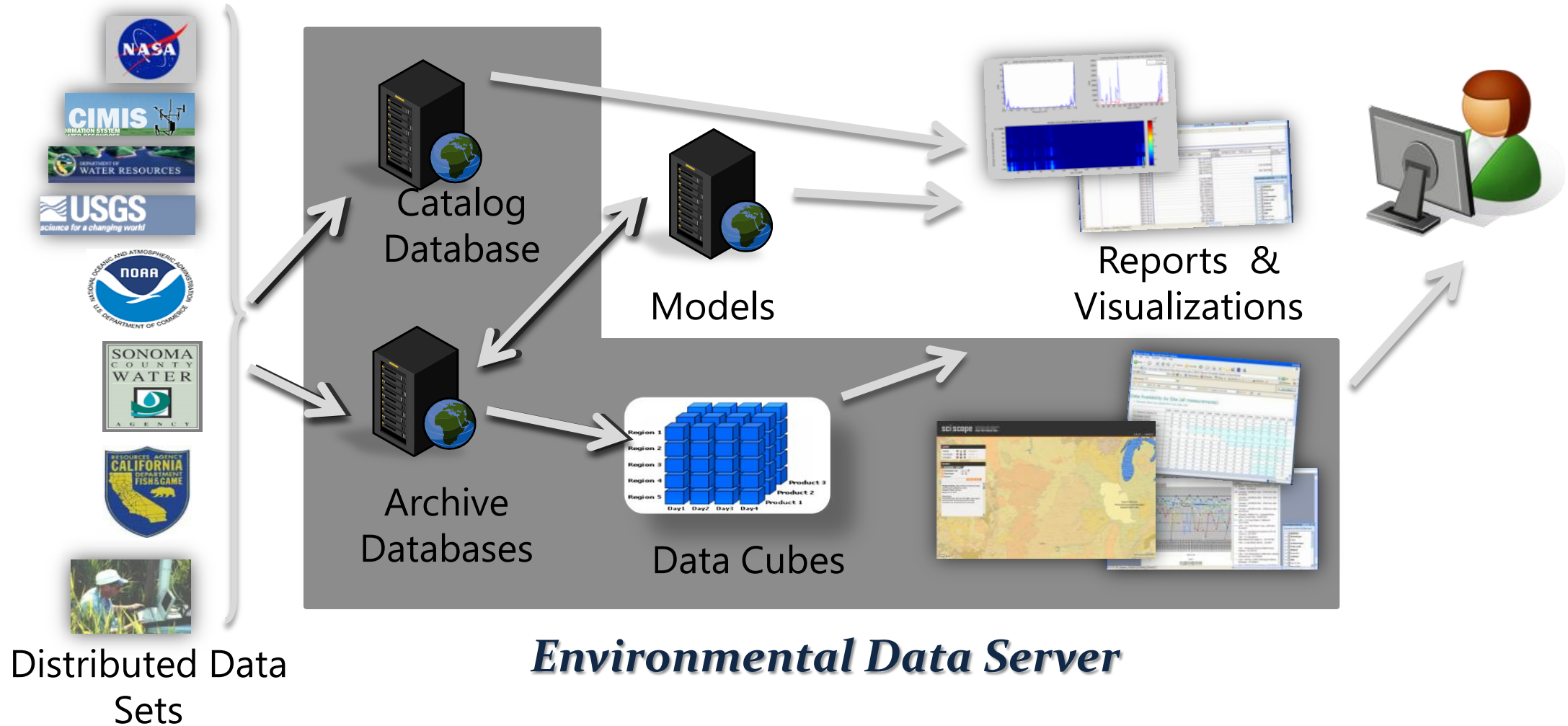
- USGS stream gauges
- Coho presence/absence data
- MODIS evapotranspiration
- Cross section locations
- Samples from 1997
- Stream temperature gauges
- Water system
- Obstructions and other
- Human activities

Data Access and Mining – Time Series Data

- Organize data by its natural dimensions
 - Watershed
 - Stream
 - Data type
 - Time
 - etc
- Select
 - Aggregations – yearly, monthly, stream, etc
 - Filters – watershed, years,
- Search for specific characteristics
- Browse and display data in the way that makes sense to the viewer

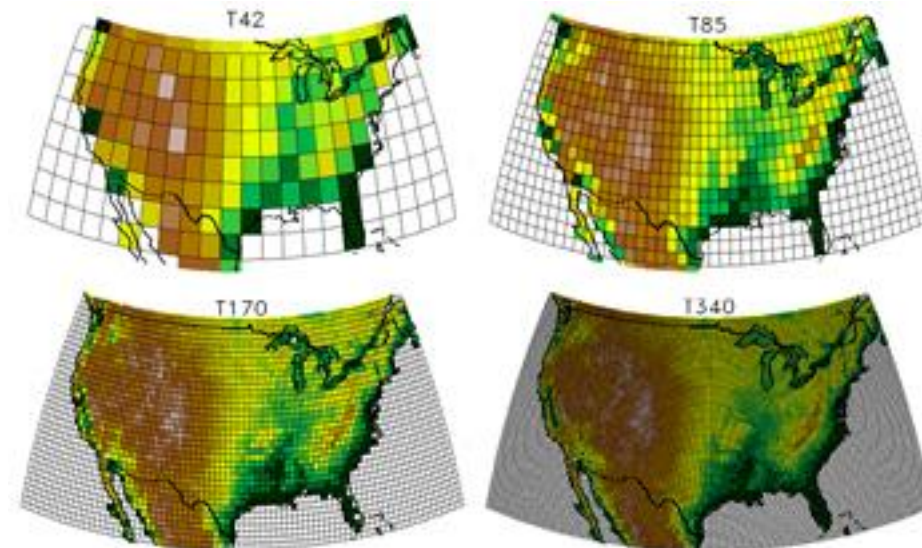
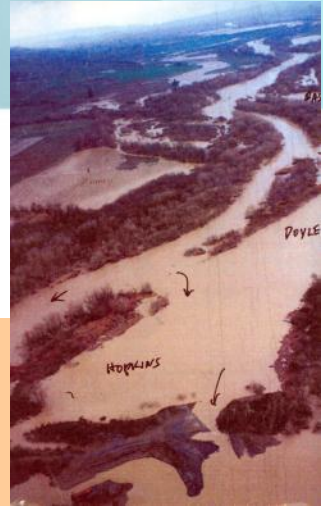
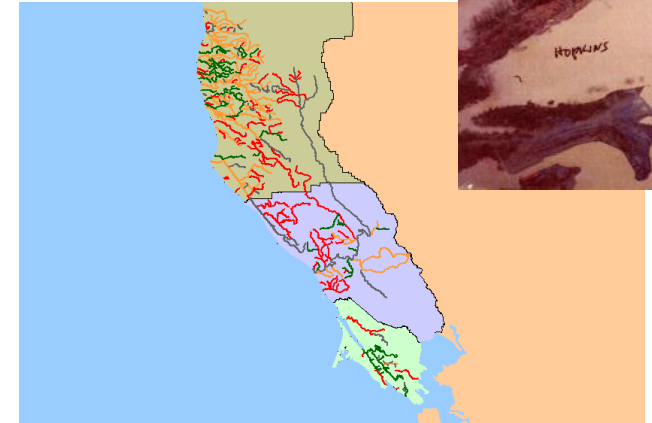
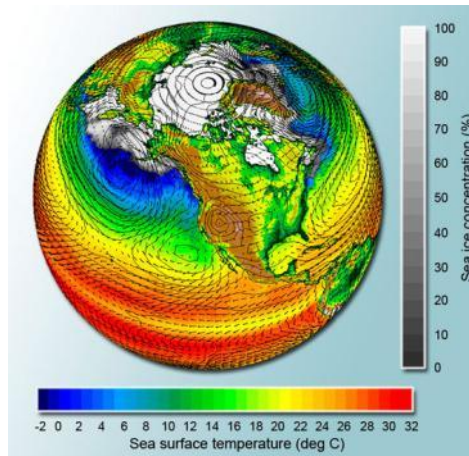
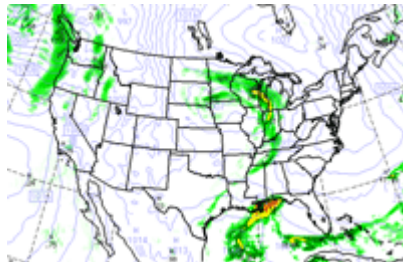


Data Analysis Infrastructure For Time Series Data



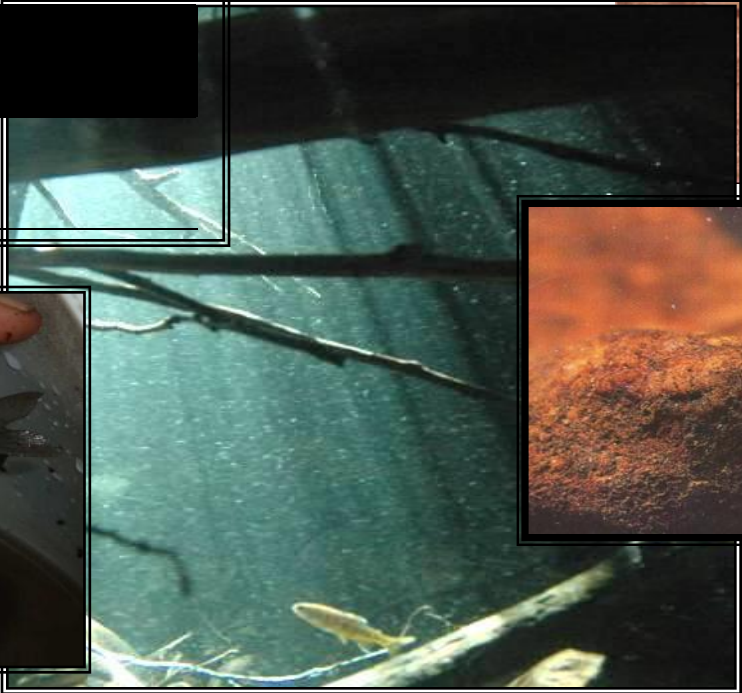
Non-Time Series Data

- One-time or infrequent event information
- Approximate measurements
- Raster images
- Photographs
- Video
- GIS information and shape files
- Model output



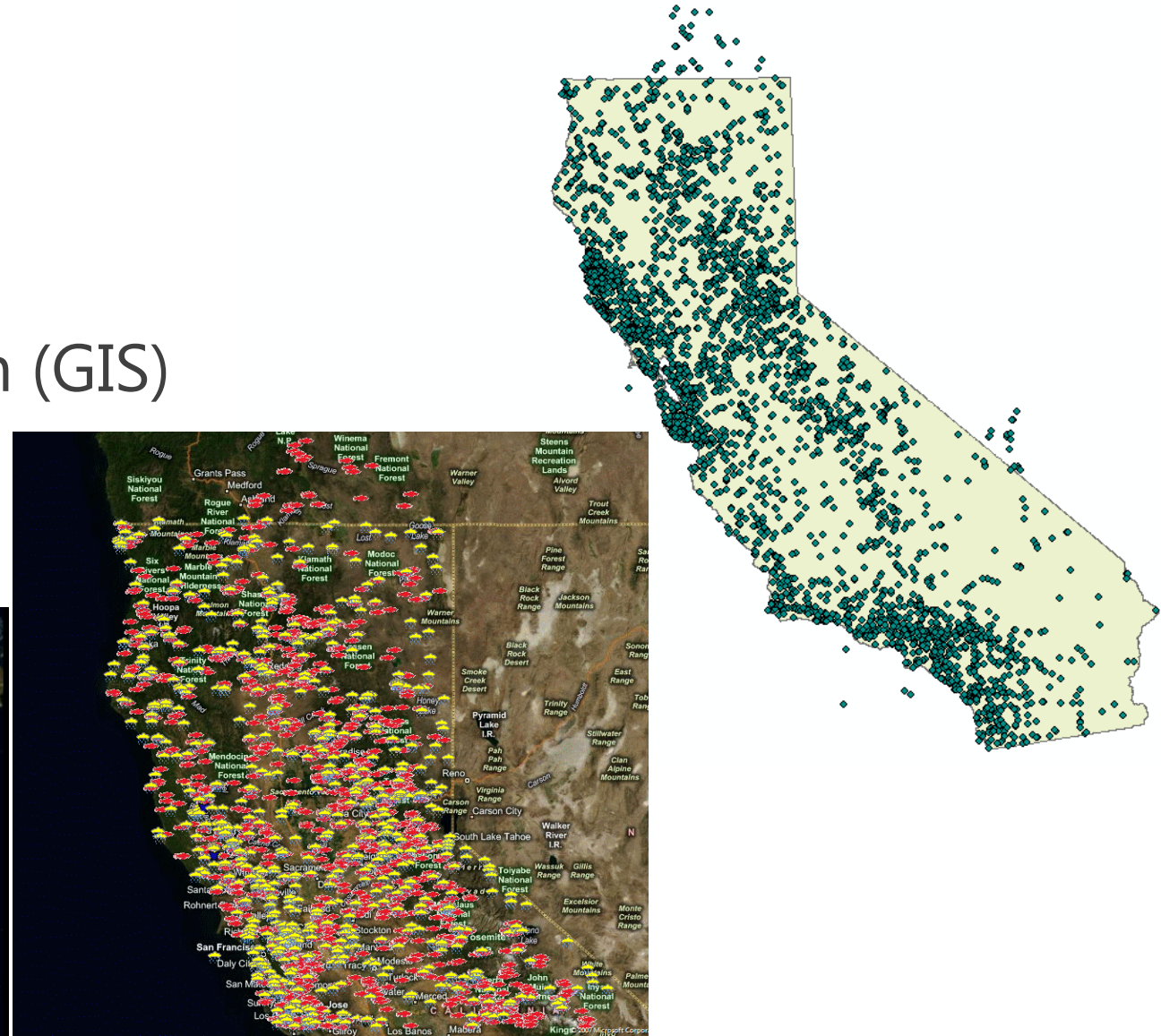
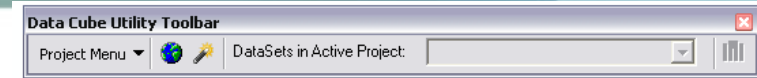
Salmon Lifestages - Different Conditions

LIFE STAGE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult migration												
Spawning												
Egg Incubation												
Emergence/ Fry												
Juvenile rearing												
Emigration												



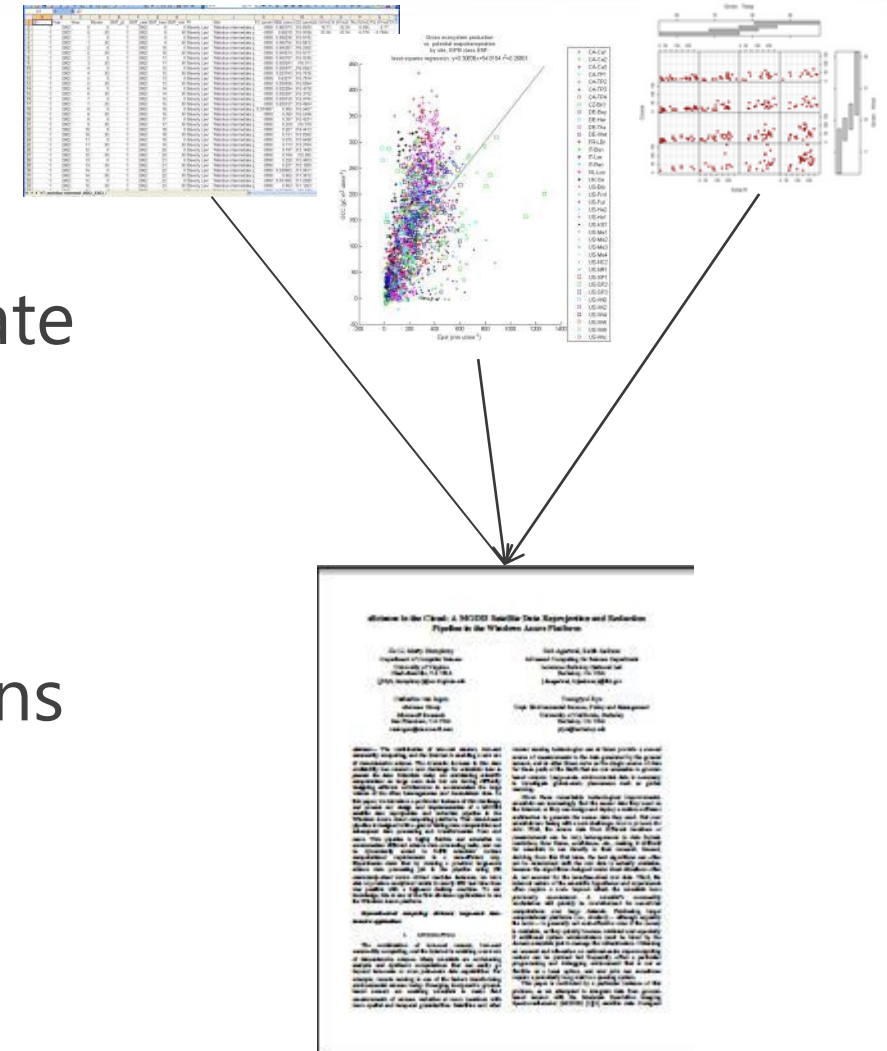
A Start on this Issue

- Mashups
 - Browsing in a geographic view
 - Overlays of rasters
 - Popups with data
- Geographic Information System (GIS)
 - Connection to time series data
 - Operate in a geographic tool



Synthesis Challenge

- Find the data needed – Agency sites, individual researchers, networks, . . .
- Convert it to a format and units appropriate to the analysis
- Interpolate in space or time as needed
- Gap fill and quality assess
- Understand appropriate use and limitations
- Perform the analysis
- Gather all the 'fair-use' criteria and acknowledgments
- Publish the paper



[illegible][illegible]

Challenge - Web of Data and Papers

- Data archiving is just the beginning
- Data Publications – about the data
- Capture the contributor information, fair-use criteria, and acknowledgments
- Connect to papers that used the data to the data
- Capture analysis artifacts and connect them in
- Capture data corrections/gap-fills/quality assessment
- Capture data versions and link them
- Further increase data sharing

Global Convergence in the Temperature Sensitivity of Respiration at Ecosystem Level

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Paper: Terrestrial Gross Carbon Dioxide Uptake: Global Distribution and Co-variation with Climate

Authors: Christian Beer, Markus Reichstein, Enrico Tomelleri, Philippe Ciais, Martin Jung, Nuno Carvalhais, Christian Rötter, M. Alai Arain, Dennis Baldocchi, Gordon B. Bonan, Alberte Bondeau, Alessandro Cescatti, Gitta Lasslop, Anders Lindroth, Mark Lomas, Sebastian Luyssens, Hank Margolis, Keith W. Oleson, Olivier Roupsard, Elmar Veenendaal, Nicolas Viovy, Christopher Williams, F. Ian Woodward, Dario Papale

Click here to see the abstract (from Science on-line)

Look below to see the sites contributing to the study (it might be necessary to install Silverlight)

Site level principal investigators and contributions

Read view | Jump to site | ...



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